RADIATION SAFETY

FORT SILL, OK

Preventive Medicine Activity
Health Physics Section
Instructor: SPC Fisher

PURPOSE

To provide training and information concerning:

- Radiation Terms and Sources
- Risk and biological effects of radiation exposure.
- ALARA concept and Dosimetry
- Methods to reduce radiation exposures

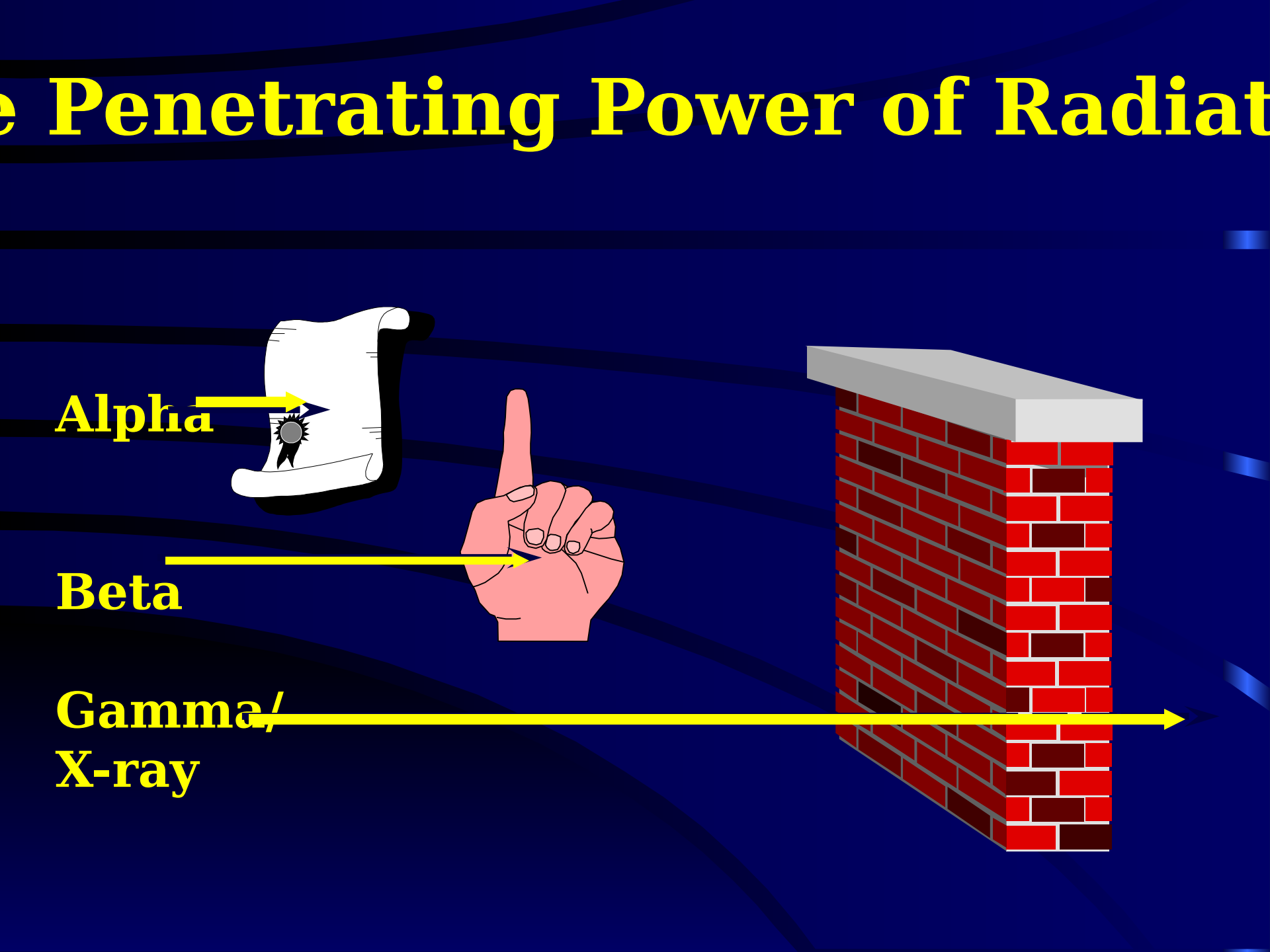
Types of Radiation

- Ionizing Radiation
- Non-Ionizing Radiation

Non-Ionizing Radiation

Radiation that does not have the ability to strip electrons, but can still cause biological damage by causing chemical changes (UV) or by heating (vibrating) molecules. Examples are ultraviolet light, microwaves, ultrasound, sonar, radar and any source of electromagnetic energy.

e Penetrating Power of Radiat



Radiation vs Contamination

- Radiation is the emission from an atom of a particle or light photon of some energy

- Contamination is the presence of radioactive materials on a surface and has left the direct control of the technicians.
- Contamination must be cleaned up immediately.

Biological Effects of Ionizing Radiation

- Ionizing Radiation has the ability to strip electrons from their orbits.
- In cells, damage is caused by the deforming of molecules where electrons have been stripped and the electrical charge of the molecule has been altered.
- Specifically, this occurs in proteins but can occur in any molecule.

Biological Effects of Ionizing Radiation

- Cells are designed to recover from constant bombardment. Molecules wear out just like all machines and are constantly being replaced by the mechanics of the cell. Concentrations of most molecules in a cell are maintained and therefore the importance of one or even many events in a cell are statistically insignificant.

Where are Radio-isotope Ionizing Sources Located?

- Nuclear Medicine
- Health Physics Office (Bldg. 2777)

An inventory of all radioactive sources is maintained at the Health Physics Office.

Radiation warning signs are posted where sources are located and should be heeded.

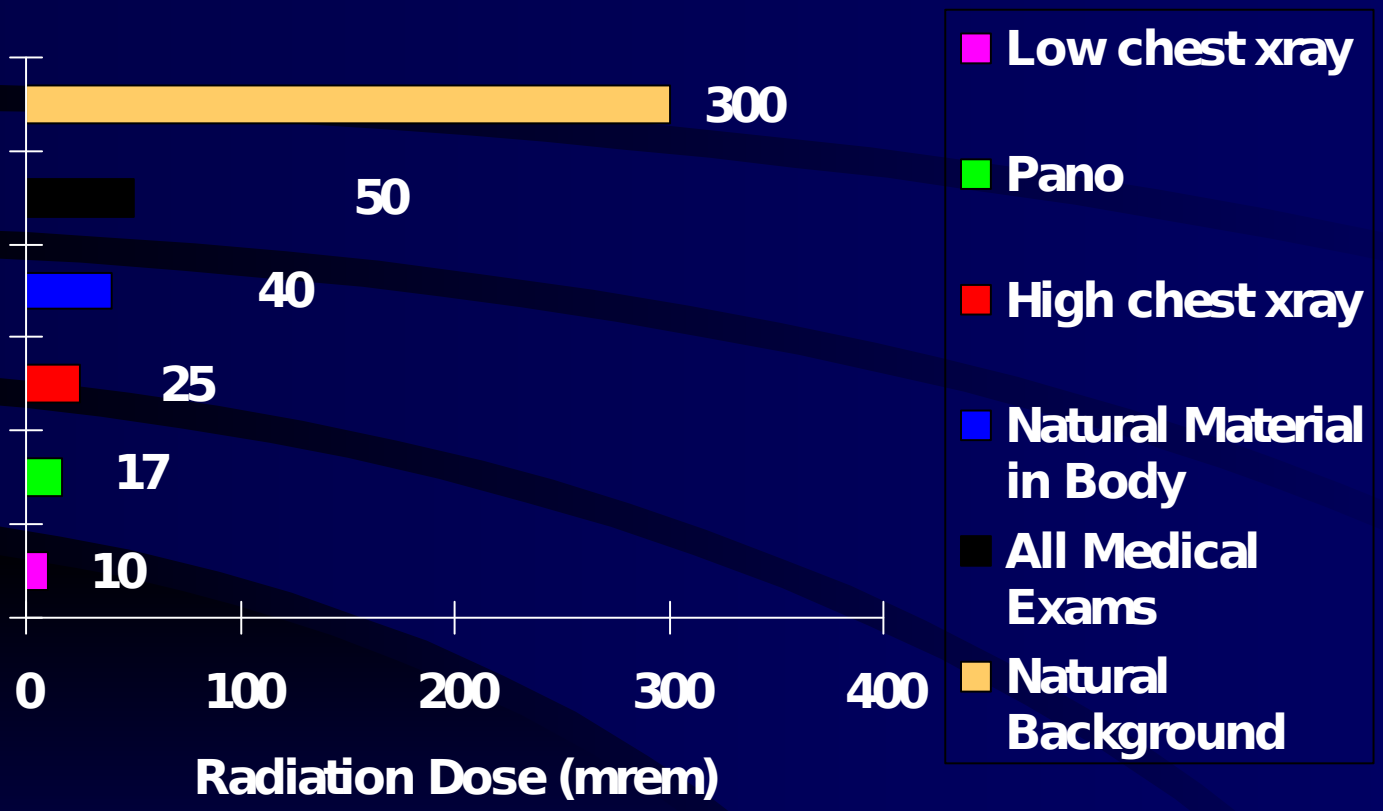
Machine Produced Radiation Sources

- Radiology Department
- Operating Room
- ER
- Newborn
- Podiatry
- Dental Activity

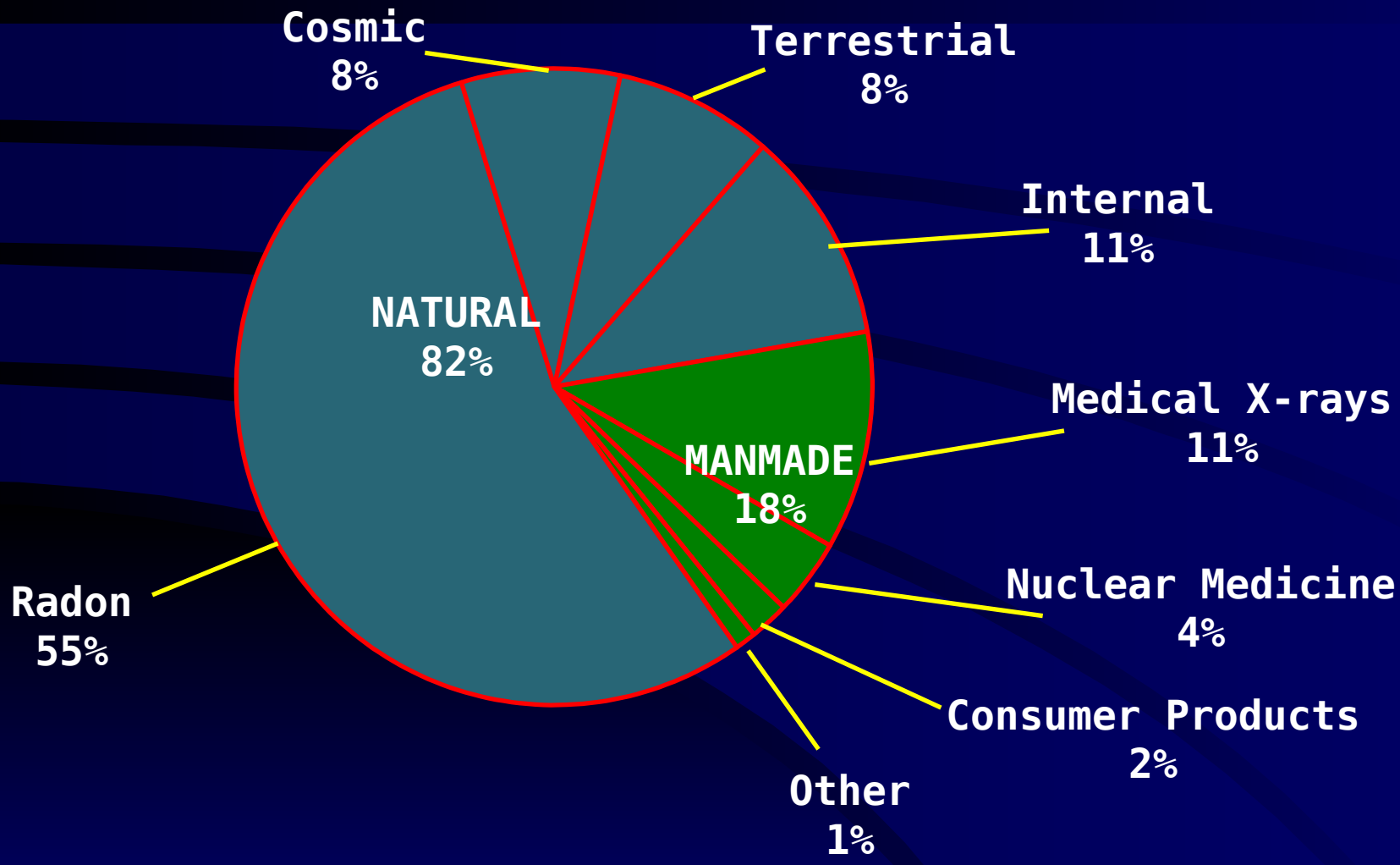
Units of Exposure

- The threshold for damage to the human body is 100 rad. It is a measurement of exposure.
- 1 Rad = 1 Rem
- 1 rem = 1000 mRem
- 100,000 mRem then = 100 Rad

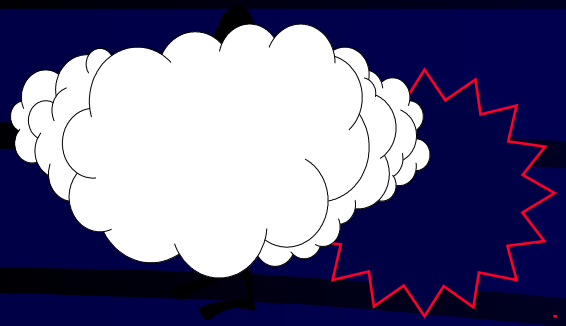
Comparison of Natural Background and Medical Exposures



Radiations to the Average Dose



xamples of Natural Radiatio



From the sky - About 30 mRem/yr

From the air - About 200 mRem/yr

From our food and drink
About 40 mRem/yr

From soils and building materials
About 30 mRem/yr

Life Expectancy Lost

Health Risk	Est. Life Lost
Smoking 20 cigs a day	6 years
Overweight (15%)	2 years
Alcohol (US Average)	1 year
All Accidents	207 days
Occupational dose (1 Rem/yr)	51 days

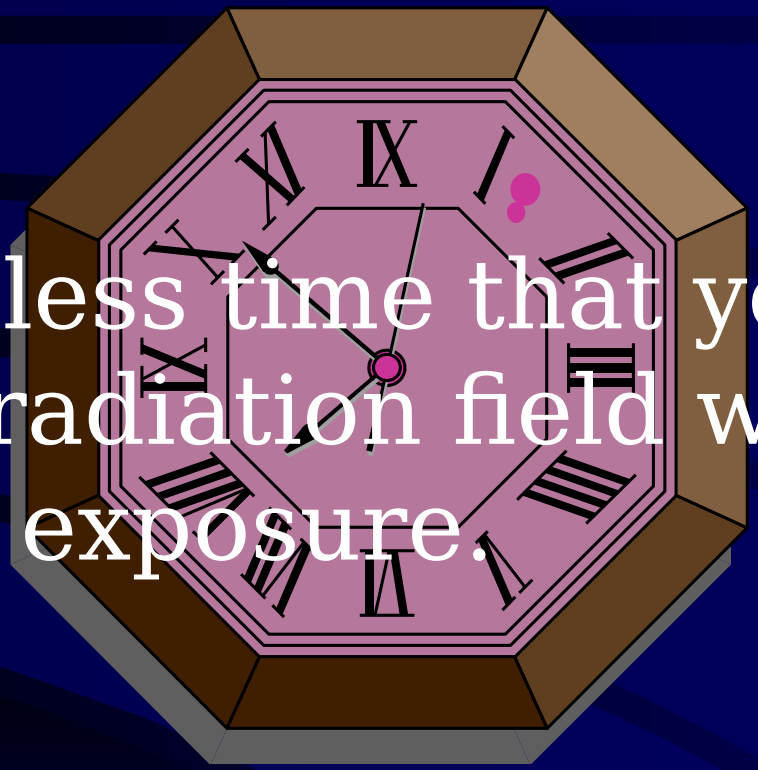
ALARA Principle

AS LOW AS REASONABLY ACHIEVABLE

There are three methods that can be used to reduce your exposure.

- **Time**
- **Distance**
- **Shielding**

Time

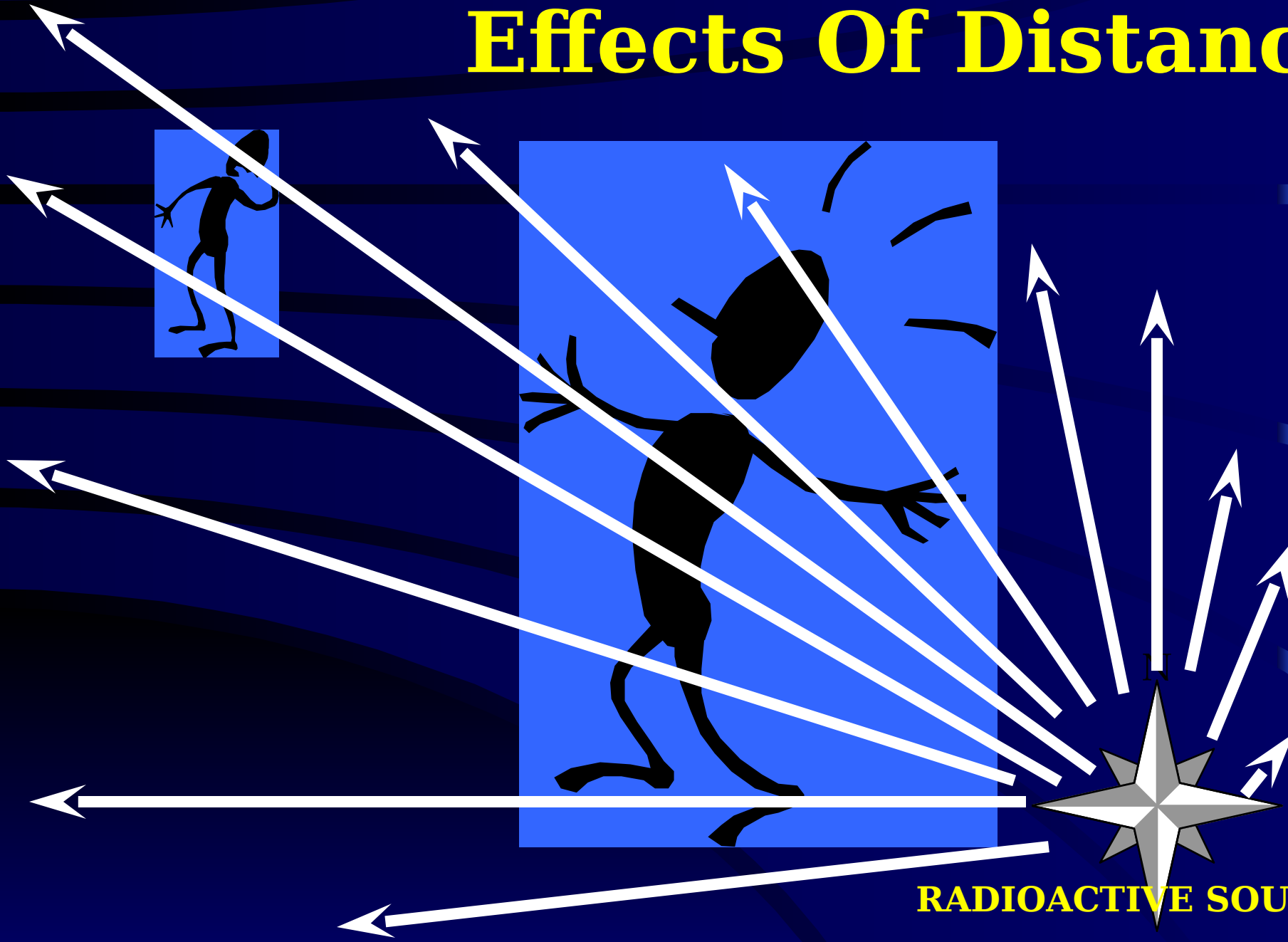


The less time that you spend in a radiation field will lower your exposure.

Distance

The farther away you are from a source, the lower your exposure will be.

Effects Of Distanc



Shielding

Any dense material placed between you and the source you will lower your exposure.

- Nuclear Medicine -- Syringe Shields
- Radiology/Dentac -- Lead Aprons, Gloves and anything that is available (including the doctor)

Dosimetry Program

- The purpose of this program is to monitor for unusual exposures and record those exposures for the workers.

- DENTAC is not using dosimetry.

- Remember- this instruction is for radiation workers. The radiation worker in the medical activity Fort Sill can be assured that they will never receive any amount of significant radiation dose.
- The patients can also be assured of their safety because of the low output of the machines. However, protective measures for patients are still required by law and MUST be followed.
- Exposure to x-rays of a pregnant patient MUST be immediately reported to the RPO! It is a matter of legal liability!

Reasons to contact the RPO

- Questions
- To declare a pregnancy
- Report a lost TLD
- Report Emergencies
- Observation of unsafe procedures
- Request Exposure Records, survey results, NRC license, or regulations, Form 3
- You have a RIGHT by law to these things!!!

Worker's Responsibilities

- Work in a safe manner
- Comply with radiation protection regulations
- Report unsafe procedures

Radiation Emergencies

- Machine Produced
  - Turn off the main breaker
  - Notify the RPO
- Nuclear Medicine
  - Isolate and contain the spill
  - Clean and monitor the area
  - Notify the RPO

Reporting Procedures

Contact the Radiation Protection Office at 442-6193/5211.

1LT Michael D. Hiett - Chief *

SPC Kent A. Fisher - NCOIC

* Effective as of 5 MARCH 2001

Radiation Protection Instruction Aides

- Training Films on Ionizing and Non-ionizing radiation protection
- Specific Federal and Army Regulations
- The Nuclear Medicine License and Department of the Army Radioactive Authorization

Questions?

Have a Nice Day!